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PARTICIPATORY SWOT ANALYSIS OF THE INTELLECTUAL PROPERTY MANAGEMENT SYSTEM IN THE NATIONAL RESEARCH CENTRE ON MEAT: STRATEGIC IMPLICATIONS FOR TECHNOLOGY MANAGEMENT

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ABSTRACT

The study analyzed the strengths, weaknesses, opportunities, and threats pertaining to the Intellectual Property Management System (IPMS) of National Research Centre on Meat, a south zone animal science research institute under Indian Council of Agricultural Research (ICAR). The IPMS constituted the institutional system that performed the functions of intellectual property creation, protection, and transfer/commercialization. A SWOT repository was developed based on inputs received from relevant literature, institute's scientists and selected stakeholders. Based on ratings of the repository items by scientists, the top ten key strengths, weaknesses, opportunities and threats were identified. The top rated key strengths included 'Institute Technology Management Unit with access to the attorney for patent filing' and 'registered logo and trademark', whereas, 'Inadequate technical / supporting staff' and 'lack of a system for registering licensees in industries for commercialization' were the top-ranked key weaknesses. The key opportunities included 'Joint ventures with outside organizations for product development, evaluation and upscaling' and 'Geographical Indication enabling provisions for traditional and unique meat products'. The most prominent threats were 'lack of personnel with legal and commercial expertise in the veterinary field' and 'high cost of securing and maintaining IPR'. Participatory SWOT analysis enriched with weighted SWOT matrix technique was employed to identify the best strategies to improve and develop the IPMS further.

KEYWORDS: Intellectual Property Management System, National Research Centre on Meat, SWOT analysis, ICAR & Intellectual Property Rights

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Original Article

INTRODUCTION

In the contemporary knowledge anchored global economy, the pivotal role of Intellectual Property Rights (IPRs) in technology management has been widely recognized. The Trade-Related Aspects of Intellectual Property Rights (TRIPS) Agreement advocates member nations to put in place minimum standards for intellectual property protection in all technology areas including those of agricultural and livestock sectors. In a developing economy like India, the establishment of IPR regime in these realms implies revolutionary changes in the norms and ethos of generation and dissemination of innovative research outcomes.

In the Indian context, the public sector research organizations and universities at par with competent business houses and corporate bodies have ample opportunities for efficient dissemination and commercialization of IPR enabled technologies. The Intellectual Property Right of one form or the other could increasingly be used as a value addition tool in technology marketing. Public-private partnership (PPP) strategies through industry linkages enable research organizations to carry out collaborative research besides joint validation, refinement, up-scaling, and trading of critical research outcomes. The monetary benefits such as royalty and licensing fees ensued from commercialized technologies could be effectively utilized in incentivizing innovator researchers as well as strengthening institutional infrastructure. Such an approach fosters investment in research and development besides instilling an innovative research ambience in universities.

The National IPR Policy, Government of India, 2016, (GOI, 2016) envisages an academia-industry interface for promoting functional reciprocity of ideas and IPR has driven research along with nurturing links between research institutes and industrial sector for industry-oriented research, technology commercialization, and entrepreneurship development. The Science, Technology, and Innovation Policy, 2013, Ministry of Science and Technology, also emphasizes the need for enhanced participation of private sector in Research and Development, streamlining research outputs into commercial and societal applications (GOI, 2013).

Being the nodal agency of the National Agricultural Research System (NARS), the Indian Council of Agricultural Research (ICAR) has put in place a well-crafted policy framework and institutional mechanism for the protection and transfer or commercialization of its intellectual property resources since 2006. The institutional mechanism comprises of a three-tier structure with the Institute Technology Management Units (ITMUs) at the individual institute level as the base layer, five Zonal Technology Management Centers (ZTMCs) in selected institutes at the zonal level as the intermediate layer and the Agro Technology Management Centre (ATMC) at the central level as the apex layer. In addition, at the ICAR head-quarters, the Intellectual Property and Technology Management unit (IP and TM Unit) monitors the functioning of these bodies. The ZTMCs located in different zones coordinate and facilitate the activities of the ITMUs in the respective zones. The south zone ZTMC located in the Central Institute of Fisheries Technology (CIFT) coordinates the functioning of the ITMUs of 22 ICAR research institutes including that of the National Research Centre on Meat, under its ambit. The functional decentralization strategy envisaged by the guidelines delegates sufficient powers and internal capabilities to the Intellectual Property Management Systems (IPMSs) of the individual institutes.

Against the backdrop of the IPR portfolio model in ICAR that pursues steadily towards executing informed decisions in technology management, it is imperative to study the system in due depth. No such studies have been reported so far. The present study entails participatory SWOT analysis of the Intellectual Property Management System (IPMS) in the National Research Centre on Meat (NRCM), a south zone animal sciences research institute of ICAR. The mission of NRCM is to develop the country's meat sector into an organized and modernized one through the deployment of innovative technologies in production and processing aspects for stakeholders including meat animal producers, processors, and consumers (ICAR-NRCM, 2014-15).

It is expected that the findings would be useful to strategize modalities for the institutionalization of IPR regime in the other constituent units of the NARS including the state veterinary universities. Also, an insight in this regard is imperative to devise and implement appropriate IPR management strategies that address the specific features and requisites pertaining to IPR in the livestock sector. The present study assumes significance in this context.

MATERIALS AND METHODS

The strengths, weaknesses, opportunities, and threats pertaining to the intellectual property management system (IPMS) of the institute was analyzed based on the methods and procedures developed by Weihrich (1982), Collado *et al.* (2010) and Lu (2010).

The SWOT analysis was carried out at four consecutive phases as follows.

Defining the Institutional Intellectual Property Management System

'Intellectual Property Management System' (IPMS) was operationally defined as the institutional system that performed the functions of intellectual property creation, protection, and transfer /commercialization.

The specific attributes of the IPMS's internal and external environments that were observed to affect the system's functioning were broadly categorized into internal and external factors respectively. The internal factors were conceptualized as those attributes of the system that could be controlled and modified by the authorities to manage the institutional IP efficiently. The internal factors comprised of both strengths and weaknesses. 'Strengths' implied the factors that could be utilized effectively for the efficient management of the intellectual property. 'Weaknesses' entailed those aspects that had to be eliminated or minimized for the efficient functioning of the Intellectual Property Management System.

External factors meant those aspects beyond the institutional boundaries pertaining to the wider socio-economic, political, and environmental contexts that could influence the performance of the IPMS. The institutional authorities could seldom control or modify these factors. External factors included both opportunities and threats. 'Opportunities' referred to the external factors that improved the performance of the Intellectual Property Management System whereas 'Threats' were the attributes that impeded the performance.

Identification and Categorization of the SWOT Factors

Based on the inputs received from review of the literature, discussions with experts and pilot studies, a comprehensive repository of the internal (strengths and weaknesses) and external (opportunities and threats) factors was prepared for the institute under study. Subsequently, these factors/items were grouped under different factor domains. The factors pertaining to the strengths and weaknesses were classified under four-factor domains viz; technology, infrastructure, human resources, and technology transfer/marketing strategies. For both opportunities and threats, the factor domains defined were socioeconomic, policy, market and outside organizations. The repository was further refined in the light of focus group discussions with scientists and personal/telephonic interviews with other selected stakeholders. The stakeholder categories were suggested by the Institute Technology Management Unit authorities.

In focus group discussions with the scientists of the institute, the researcher presented the specific SWOT inventory developed for the institute and invited suggestions of the respondents. Consequently, the inventory was modified by incorporating the ideas elicited. In addition, the inputs received from selected stakeholders including industry personnel, scientists from sister organizations, professional associations, and representatives from policymaking bodies such as Agricultural and Processed Food Products Export Development Authority (APEDA) and National Academy of Agricultural Research Management (NAARM) were considered for fine-tuning the SWOT inventory.

Accordingly, the final SWOT inventory for the National Research Centre on Meat (NRCM) comprised of 42 strengths (S), 26 weaknesses (W), 60 opportunities (O) and 49 threats (T)

Validation of the SWOT Items

'Validation' meant the quantification of the importance of swot items so as to condense the exhaustive checklist of SWOT factors into more relevant and focused ones. While a multiple stakeholder approaches was adopted for developing the swot repository, the validation of the swot factors was performed following the rating procedure. Since the pivotal role of the institute's scientists in IP creation, protection, and transfer/commercialization could not be underestimated, it was decided to perform the validation of swot items from the scientists' perspective.

The respondents were requested to rate the SWOT factors on a four-point continuum viz; strongly agree, agree, somewhat agree, and disagree with scores 4, 3, 2 and 1 respectively (Appendix). The summation of scores assigned by all the respondents for a particular SWOT factor indicated the factor's score. The mean score of the factor was worked out applying the formula,

$$\text{Mean score of the SWOT factor} = \frac{\text{Score of the factor}}{\text{Number of respondents}}$$

In the score based rank hierarchy, the ten top ranking factors in each factor category were identified as the most influential key factors.

Identification and Prioritization of Strategies for Effective Functioning and Development of IPMS

At this phase, a weighted/quantitative SWOT matrix technique was employed to further enrich the output of the SWOT analysis.

The TOWS matrix, also referred to as the SWOT matrix was originally proposed by Weihrich (1982) for matching the external opportunities and threats of an organization with its internal strengths and weaknesses. The interaction matrix would further provide alternative strategies for decision making/problem-solving in an organization. Fig.1 illustrates the strategies put forward by Weihrich. The strategies are based on the interaction of the internal and external factors. Accordingly, the four strategic options would be maxi-maxi (utilize strengths to take advantage of opportunities), maxi-mini (use strengths to minimize or reduce the impact of threats), mini-maxi (to overcome weaknesses by using opportunities) and mini-mini (minimize weaknesses and reduce the impact of threats). As opined by Weihrich (1982), any organization including government organizations, to be effective, should use such rational approaches towards anticipating, responding to and even altering the future environment.

The present study, besides identifying the most influential key driving and inhibiting factors, made an in-depth analysis of the relationship between these factors to derive certain strategic decisions for the refinement and further development of the IPMS. Accordingly, based on the SWOT analysis of the IPMSs, quantitative interaction matrices of key factors were developed (Figure 2).

Table 1: Strategic Options Based on SWOT Matrix- Weihrich (1982)

	Strengths	Weaknesses
Opportunities	SO Strategy (maxi-maxi)	WO Strategy (mini-maxi)
Threats	ST Strategy (maxi-mini)	WT Strategy (mini-mini)

The matrix (Table 1) entailed matching of the five key internal factors of top scores under the strength and weakness categories with the corresponding external factors under the opportunity and threat categories. The coefficient (r) developed by Lu (2010) was used to indicate the degree of matching/relationship between any two SWOT factors wherein, r = 1 meant a perfect match, r = 0 showed a non-existent relationship and 0 < r <1 denoted different degrees of relationship ranging from non-relationship to a perfect match. The coefficients were assigned based on the consensus among the IPMS authorities of the institute.

Subsequently, for the SWOT factor pairs matched, composite scores were computed using the formula,

Composite score = Product of the score values of internal and external factors matched x coefficient (r)

The degree of importance of the consequent strategies was ascertained based on the composite scores. The scores were fed in the corresponding cells of the matrix. Further, the matrix cells were shaded with color gradations as in the 'VIBGYOR' spectrum ranging from red to violet in the decreasing order of importance.

RESULTS AND DISCUSSIONS

The findings of the study are presented below in tabular (table 2 and 3) and matrix forms (figure 2).

Data in Table 1 reveal the ten top ranking strengths and weaknesses of the IPMS in NRCM, based on the rating by the respondents.

Strengths and Weaknesses

Table 2: Perceived Importance of Internal Factors Affecting the Intellectual Property Management System

Sl. No	Strengths	Score	Rank	Weaknesses	Score	Rank
1.	Institute Technology Management Unit with access to attorney for patent filing	3.88	I	Inadequate technical/supporting staff	3.63	I
2.	Institute has developed a logo and trademark of its own	3.88		No system for registering licensees in industries for commercialization	3.25	II
3.	Institute has well-equipped meat products laboratory	3.75	II	Inadequate training exposure in IPR among scientists	3.25	
4.	Multi-disciplinary team work of scientists	3.75		No specific protocols for marketing of technologies	3.13	III
5.	Technology incubation facilities available	3.75		No effective mechanism for in-licensing of proprietary research tools	3.13	
6.	Tailor made technologies for	3.63		Lack of follow up action for getting feedback from	3	

	small scale ventures are available		III	beneficiaries		IV
7.	Has capabilities in quality control systems	3.63		Utilization of intranet facilities for institutional IP management not effective	3	
8.	Networking with reputed outside R&D institutions supports technology development	3.63		Lack of follow up action for getting feedback from beneficiaries	3	
9.	Thrust on SHG approach enhances technology dissemination	3.63		Lack of in-house faculty with legal expertise in IPR	3	
10.	Technology awareness workshops empower stakeholders	3.5	IV	Sustainable income through licensing fees and royalty not yet achieved	2.88	V

Perceived Strengths

It is notable that accesses to legal expertise for patent filing and ownership of the registered trademark for technology products were the most significant strengths of NRCM's IPMS as rated by the scientists. As opined by them, such trends would certainly have a cascading effect on an evolving IPR culture in the institute. Reportedly, the institute filed three patent applications though claimed no granted patents so far. The institute has also conferred the ISO 9001:2008 certification mark for quality control systems. The significance of the trademark as a commercialization tool in the agriculture and livestock sectors has been reaffirmed by many authors. (Ramesha, 2011; Sreedharan, 2011; Suman and Pandey, 2014).

Indubitably, infrastructure along with human resources (Jain and Sharma, 2006) has got a pivotal role in IP generation, protection and commercialization in R&D organizations. The institute's well-equipped meat products laboratory and capabilities in quality control systems were perceived as important strengths by the researchers.

Presumably, the institute's research strategies in developing competitive technologies were highly appreciated by the scientists. This is evident from the high rating of multi-disciplinary teamwork and networking with outside R&D organizations as the strengths of the IPMS. The institute claimed undertaking contract research with private industry in addition to external funded projects from government departments and agencies. Samuel *et al.* (2014) opined that R&D institutions and universities could manage the shortage of resources by engaging in collaborative research with institutes/ universities, industries, and government agencies.

The scientists, seemingly, internalized the significance of small-scale technologies with locally available ingredients and low-cost appliances in the Indian context. The priority accorded to tailor-made technologies for small-scale ventures is indicative of this. The technology transfer/ commercialization strategies including technology incubation, SHG approach for technology dissemination and technology awareness workshops for stakeholders were also highly valued by the scientists.

Perceived Weaknesses

The inadequacies pertaining to human resources such as shortage of supporting/technical staff and lack of in-house faculty with legal expertise and training exposure in IPR were viewed as serious weaknesses by the scientists. Misra *et al.* (2011) found that IPR awareness among scientists in Indian R&D and academic institutions still remained as an unfulfilled goal.

The scientists perhaps voiced their concerns regarding the legal and economic stakes in procuring research tools by rating high, the absence of an efficient mechanism for in-licensing. From a strategic point of view, measures such as in-licensing of research tools, patent pooling (Taylor and Cayford, 2002; ICAR, 2006) and cross-licensing (Taylor and Cayford, 2002) have been suggested to ensure freedom to operate in research. Another infrastructural lacuna perceived important was the lack of intranet facilities for interlinking the IP database of the institute to that of the zonal and central institutes of ICAR.

It is worth noting that the scientists perceived many bottlenecks in the IP commercialization realm. The shortfalls included lack of specific protocols for technology marketing, an absence of a system for registering licensees in industries, inadequate follow up of beneficiaries for feedback and failure to monitor marketing practices by licensees. Also, the system was yet to receive sustainable income through licensing fees and royalty emanating from commercialization. Kamiyama *et al.* (2006) pointed out that intellectual property management should realize the value of patented inventions through licensing practices. They reiterated the need for linking patients with innovation through incorporation into improved products and services. Jaruzelski *et al.* (2005) reaffirmed the significance of technology marketing protocols while remarking that the assessment of clear customer demand and determination of profitable means to bring the new products into the market before initiation of R&D projects by the management increases the likelihood of commercial success.

Opportunities and Threats

Table 3 shows the ten top ranking opportunities and threats of IPMS in the NRCM, based on the rating by the respondents.

Table 3: Perceived Importance of External Factors Affecting the Intellectual Property Management System

Sl. No	Opportunities	Score	Rank	Threats	Score	Rank
1.	Joint ventures with outside organizations for product development, evaluation and up-scaling	4	I	Lack of personnel with legal and commercial expertise in veterinary field	3.88	I
2.	GI enabling provisions for traditional and unique meat products	3.88	II	High cost of securing and maintaining IPR	3.88	
3.	Statutory policy making and regulatory bodies viz; APEDA and FSSAI	3.75	III	Lack of trained and skilled manpower in food processing sector	3.88	
4.	Training opportunities in IPR and its management	3.75		Procedure for grant of IPR by Patent Office/ Intellectual Property Office is time consuming	3.88	
5.	Growing trend towards nuclear families with	3.75		Red tape delay for final approval of	3.75	II

	working women			entrepreneurial projects		
6.	Credibility of the institute among public	3.63	IV	Prevalence of unhygienic and inhumane slaughtering practices	3.63	III
7.	National Institutions for promoting R&D in food processing (NIFTEM&NMPPB)	3.63		Lack of coordination between schemes by different ministries on food safety and security	3.63	
8.	Technology incubation requirements of start-up companies	3.63		Perishability of meat	3.63	
9.	Growing demand for diverse and value added meat and meat products	3.5	V	Risks involved in Public private partnership	3.63	
10.	Demand for contract research and consultancy services from industry	3.5		Competition with meat products of outside industry	3.38	IV

Perceived Opportunities

Among the opportunities, 'Joint ventures with outside organizations for product development, evaluation, and up-scaling' was ranked first. Reportedly, NRCM had a good old culture of collaborative/ contract research and consultancy services with outside public and private institutions. The scientists appreciated the institute's prospects in exploring such joint ventures for effective management of IP. Mysore (2014) contended that a joint venture research strategy would be a viable alternative as the involvement of a private sector partner with active funding support right from the commencement of research projects would facilitate the commercial viability of project outputs along with additional benefits.

The start-up companies, being the trendsetters in the current economy, the scientists could not ignore the tremendous prospects related to the technology incubation requirements of start-ups. With the technology support and business incubation facilities offered by R&D organizations, the start-up companies/SMEs could be instrumental in the translation and commercialization of public sector research (http://www.sciencebusiness.net/).

The respondents were hopeful of the opportunities emanating from the contemporary social contexts such as the reputation of the institute among the public and the growing demand for diverse and value-added meat products, especially, with the expanding nuclear family set-ups. The reports on emerging trends and scope of ready-to-eat foods in India depict that with a rise in income levels and urbanization, coupled with a larger proportion of nuclear families and working women, the demand for milk, meat, processed foods, and ready-to-eat foods is increasing (Alexander, 2009). Dhobi and Malla (2015) reported an increase in consumption of food products of animal origin due to growing urban population, a rise in income level of the middle class and an increasing proportion of women in the workforce.

In the policy terrain, the top-rated prospects pertained to the anticipated support and assistance from regulatory and policy bodies like Agricultural and Processed Food Products Export Development Authority (APEDA) and Food Safety and Standards Authority of India (FSSAI) and also, R&D promoting institutions like National Institute of Food Technology Entrepreneurship and Management (NIFTEM) and National Meat and Poultry Processing Board (NMPPB).

The scope of Geographical Indications (GIs) for traditional and unique meat products was rightly perceived as a high-end opportunity by the scientists. Traditional meat-based food products have tremendous scope for registration as GIs, as traditional food products constitute one of the vital elements of cultural heritage (Alam *et al.*, 2009).

Perceived Threats

As rated by the scientists, the IPMS of the institute was buoyed with challenges/threats like the high cost and time-consuming procedure for the grant of IPR by the patent office, the general dearth of personnel with legal and commercial expertise in the veterinary field and red tape delays in final approval of entrepreneurial projects. Dutfield (2003), after reviewing the IPR systems of developing countries reported that most IPR systems encountered threats like high enforcement and administrative costs and lack of qualified patent examiners to handle a high volume of patent applications leading to backlogs of unexamined applications. He also observed the outsourcing of financial and technical assistance due to regulators' lack of experience in dealing with IPR-related matters as the weakness of the system.

The respondents were also concerned about overlapping schemes and policies of different ministries that reportedly created confusion while implementing the projects. Further, the risks involved in Public-Private Partnership (PPP) were voiced as issues that would hamper the interests of the IP ecosystem. The United Nations Economic Commission for Europe (2011) reported that the research organizations and universities in various countries faced certain risks in PPP such as conflicts with their mission, research culture, differences of opinion over IP ownership, conflicts in revenue sharing and inefficient IP management. The inherent lacunae in the meat processing sector such as lack of infrastructural facilities, trained and skilled manpower, and unhygienic and inhumane slaughter practices were conceived as threats probably because of the concern that these in turn, would impede the forward pathways in technology applications.

Strategies for Future Development of IPMS

S-O Strategies

The SWOT analysis enriched with the weighted SWOT matrix technique has brought out certain significant and pragmatic strategies (Fig.2) to improve and develop the NRCM's IPMS further. It would be beneficial to discuss the strategies derived from the right combination of the key strengths of the system and key opportunities ahead.

The strengths of the system such as the state of the art meat products laboratory with quality control systems, multidisciplinary teamwork of scientists and technology incubation facilities could be effectively employed to gain from the opportunities tendered by joint ventures with outside organizations for product development, evaluation, and up-scaling. There have been mounting evidence on the impetus of joint ventures on successful technology commercialization. The success stories related to technology transfer efforts through university-industry research collaborations in emerging economies like Brazil and Chile illustrate successful academia-industry linkages for technology transfer (Mysore, 2014).

The system's infrastructural strengths including the laboratory and business incubation facilities could be channeled to spur GI registrations for traditional and unique meat products. To ensure food security in the traditional foods sector, local institutions need to perform an informant's role in educating producers on new technological advances (Alam *et al*., 2009; Ukpabi, 2009).

The strategic link between the business incubation facilities of the institute (strength) and the support extended by the Agricultural and Processed Food Products Export Development Authority (APEDA) and Food Safety and Standards Authority of India (FSSAI) (opportunity) implies that the system's existing business incubation infrastructure could be

strengthened further with the cooperation, financial assistance and regulatory support of the policy bodies.

The ideal combination of the production infrastructure (meat products laboratory of the institute) and the market demand for processed meat products owing to the nuclear family culture with working women deserve special attention in devising marketing strategies. The institute's launch of 'meat on wheels' for the popularization and promotion of value-added meat products is an appreciable initiative in this regard (NRC on Meat, Annual report, 2014-15).

Development strategies hover around the observed linkages between the institute's infrastructural strength in the IP landscape symbolized by the 'ITMU' and the outside training opportunities in IPR. This implies that the well-established ITMU that reportedly outsourced legal expertise could be rendered self-sufficient with more training exposure to the in-house faculty. The existing awareness of IP issues and a minimum level of in-house expertise available with the IPMSs of ICAR institutes need to be nurtured with the objectives and efforts to create an environment in which scientists come out with ideas and generate an efficient innovation system (Samuel *et al*., 2014).

W-O Strategies

A perusal of the suggested combinations of system's weaknesses and anticipated opportunities spell out certain sensible strategies that are imperative to overcome the shortfalls (Fig.2). The results imply that the skill gaps and loopholes in IP management including those pertaining to advanced skills in IPR enabling of technologies, in-licensing of research tools and development of specific protocols in technology marketing could be plugged effectively through accessing the plethora of training opportunities outside. Samuel *et al.* (2014) highlight many entrants in IPR education namely, the World Intellectual Property Organization (WIPO) and Global Network of Intellectual Property Academies (GNIPA) at international level and the National Intellectual Property Organization (NIPO), NAARM, Hyderabad, some Indian agricultural universities, national law schools, Indian Institute of Management and Indian Institute of Technology at national level. Similarly, win-win collaborations and joint ventures with resourceful and relevant outside organizations in product development and up-scaling help to resolve deficits in skilled manpower. Many studies on public sector agricultural R&D institutions in developing countries bring out the widely perceived and overwhelming need for capacity building training in IPR management, bio-safety and international negotiations (Herdt, 1999).

S - T Strategies

Strategies that could be devised against the backdrop of the strength-threat combination describe how the impact of impinging threats could be minimized by utilizing the strengths of the system (Figure 2).

As an 'exclusive national research centre on meat' (ICAR-NRCM, 2015) in the public sector, the very mission of NRCM is to change the face of Indian meat sector that is crippled with lack of trained and skilled manpower and infrastructural facilities, to render it a 'modern and organised one' (ICAR-NRCM, 2014-15). The state of art infrastructure of NRCM in technology production and incubation (strength) could be instrumental in performing this task. Also, despite the general dearth of veterinary professionals with IPR and commercial expertise (threat), the well-founded IPMS of NRCM could perform the technology management tasks by outsourcing legal expertise from outside.

W - T Strategies

With a weakness-threat combination in the backstage, the best strategy would be to be aware of the limitations arising out of such combinations, as a sound knowledge of the system's constraints could be constructive in devising

futuristic strategies. The lack of legal and commercial expertise in IP management among veterinary professionals along with a dearth of skilled supporting manpower within (weakness) and outside (threat) the system warrant vigilance in this regard(Figure 2).

CONCLUSIONS

The findings of the study imply that

- Strategic emphasis on IPR and technology management training for the scientific community deserves utmost importance to further strengthen the IPR portfolios for efficient generation, protection and transfer / commercialization of IP resources.
- Employing market watch and market intelligence interventions to promote the commercial viability of technology products is essential to address market risks.
- Establishment of commercialization models to provide improved business incubation facilities for start-ups.
- A foolproof in-house patent watch mechanism for judging the patentability of innovations would improve the IP management capabilities of the IPR portfolio.
- It is a strategic imperative to ensure freedom to operate through centralized procurement and in-licensing of proprietary research tools in research as envisaged in ICAR policy framework.
- Efforts to use trademarks and geographical indications as commercialization tools in product marketing would pay much dividends in IP management.
- Mooting policy discussions in academic spheres on IPR related techno legal and ethical issues including patents blocking research, broad-based patents impacting research, misuse of monopoly rights, 'tragedy of anticommons' and ethical issues on certain biotechnology patents would be of immense help to resolve issues and bring in combating institutional mechanisms.

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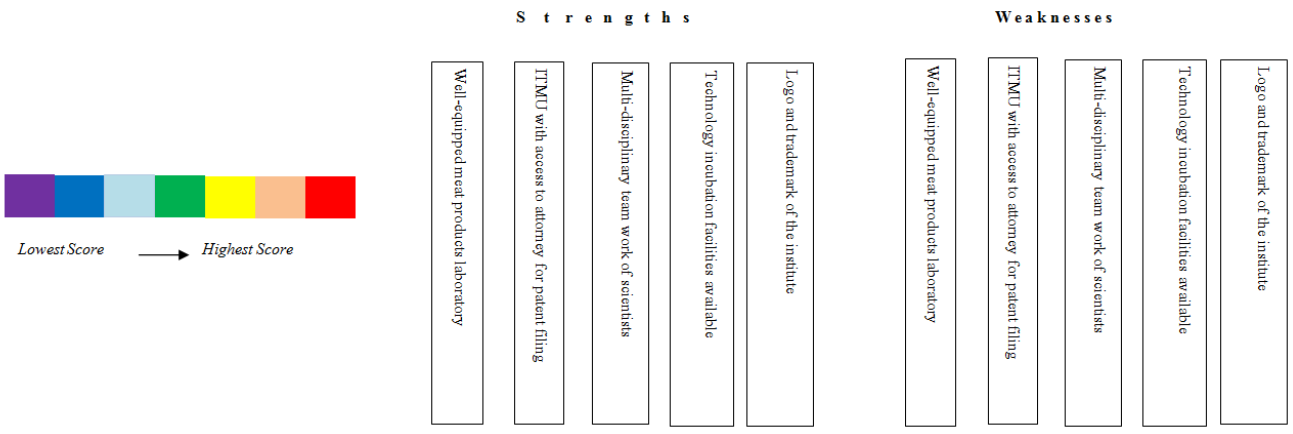

Figure 2: Weighted SWOT Matrix Showing Strategies (S-O, W-O, S-T, W-T) for Further Development of IPMS of NRCM

REFERENCES

1. *Alam, G.M., Hoque, K.E., Khalifa, M.T.B., Siraj, S. and Ghani, M.F.A. (2009). The role of agriculture education and training on agriculture economics and national development of Bangladesh. African Journal of Agricultural Research, 4(12), 1334-1350. Retrieved from*
2. *http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.1030.7998&rep=rep1&type=pdf*
3. *Alexander, R.D. (2009). RTE foods: spreading their wings. Modern Food Processing, Special feature.48-51. Retrieved from*
4. *http://www.tsmg.com/download/reports/RTE%20Article%20Modern_Food_Processing_March%2009.pdf*
5. *Collado, D.M., Gandini, G., Haas, Y. De. and Díaz, C. (2010). Decision-making tools for the development of breed strategies. In: Hiemstra,S.J., de Haas, Y, Mäki-Tanila, A. and Gandini,G. (eds.), Local Cattle Breeds in Europe- Development of Policies and Strategies for Self-sustaining Breeds. Wageningen Academic Publishers, 120-139. Retrieved from*
6. *www.regionalcattlebreeds.eu/publications/documents/9789086866977cattlebreeds.pdf*
7. *Dhobi, I.A. and Malla, B.A. (2015). Indian feed industry past perspective and future challenges. Think grain think feed. 2(2): 18-20. Retrieved from*
8. *http://benisonmedia.com/indian-feed-industry-past-perspective-and-future-challenges/*
9. *Government of India. (2013). Department of Science and Technology, Science, Technology and Innovation Policy. Retrieved from*
10. *http://dst.gov.in/st-system-india/science-and-technology-policy-2013*
11. *Government of India. (2016). Ministry of Commerce and Industry, Department of Industrial Policy and Promotion, National Intellectual Property Rights Policy. Retrieved from*
12. *http://dipp.nic.in/English/Schemes/Intellectual_Property_Rights/National_IPR_Policy_08.08.2016.pdf*
13. *Herdt, R.W. (1999). Enclosing the global plant genomic commons. Paper presented at China Center for Economic Research. 20p. Retrieved from*
14. *http://www.iatp.org/files/Enclosing_the_Global_Plant_Genetic_Commons.pdf*

15. *Indian Council of Agricultural Research - National Research Centre on Meat (2014-15). Annual report 2014- 15 of National Research Centre on Meat, Chengicherla, Hyderabad. 76p. Retrieved from*
16. *http://nrcmeat.org.in/wp-content/uploads/2015/06/Annual_report_2014-15_Final.pdf*
17. *Jain, K. and Sharma, V. (2006). Intellectual property management system: an organizational perspective. Journal of Intellectual Property Rights, 11(5), 330-333. Retrieved from*
18. *http://nopr.niscair.res.in/bitstream/123456789/3595/1/JIPR%2011(5)%20330-333.pdf*
19. *Jaruzelski, B., Dehoff, K., Bordia, R. And Hamilton, B. A. (2005). The Booz Allen Hamilton Global Innovation 1000: Money Isn't Everything. Resilience Report, Strategy Business Magazine, Booz Allen Hamilton, New York. Retrieved from*
20. *http://www.strategy-business.com/article/05406?gko=3705a*
21. *Kamiyama, S., Sheehan, J. and Martinez, C. (2006). Valuation and Exploitation of Intellectual Property. STI Working Paper, OECD. Retrieved from*
22. *http://econpapers.repec.org/paper/oecstiaaa/2006_2f5-en.htm*
23. *Lu, 2010 W. Lu, W. (2010). Improved SWOT approach for conducting strategic planning in the construction industry. Journal of Construction Engineering and Management, 136 (12), 1317-1327. Retrieved from*
24. *http://bsun04.bre.polyu.edu.hk/BRE_workshop/pdf/COENG-470%20-%20An%20Improved%20SWOT%20analysis.pdf*
25. *Misra, V., A. Gaur, A and Songara, R. (2011).*
26. *Management of intellectual property rights in India. Biological Forum — An International Journal, 3(1), 15-18. Retrieved from*
27. *http://www.researchtrend.net/bfij/bf31/4%20VEDANT%20MISHRA.pdf*
28. *Mysore, M. (2014). Technology transfer and commercialization- innovative model for strengthening research and industry linkages and valuation through public private partnership in agriculture. Journal of Intellectual Property Rights, 19(3), 167-176. Retrieved from*
29. *http://nopr.niscair.res.in/bitstream/123456789/28923/1/JIPR%2019(3)%20167-176.pdf*
30. *Ramesha, K.P. (2011). Intellectual property rights regime for livestock agriculture in India- present status and future prospects. Journal of Intellectual Property Rights, 16(2), 154-162. Retrieved from*
31. *https://www.researchgate.net/...IPR_Regimes...Agricultural...India/.../583eb51c08ae8e*
32. *Samuel, M.P., Sastry, K.R. and Venkattakumar, R. (2014). Status and prospects of IP regime in India: implications for agricultural education. Journal of Intellectual Property Rights, 19(3), 189-201. Retrieved from*
33. *http://nopr.niscair.res.in/bitstream/123456789/28925/1/JIPR%2019(3)%20189-201.pdf*
34. *Sreedharan, S.K. (2011). Agricultural research vis-a-vis the cresting IPR wave in the 21st century. Journal of Intellectual Property Rights, 16(2), 124-130. Retrieved from*
35. *http://nopr.niscair.res.in/bitstream/123456789/11570/1/JIPR%2016(2)%20124-130.pdf*
36. *Suman, A and Pandey, D. (2014). Patent trends in ICAR institutes- a review. Journal of Intellectual Property Rights, 19 (4), 260-265. Retrieved from http://nopr.niscair.res.in/bitstream/123456789/29288/1/JIPR%2019(4)%20260-265.pdf*
37. *Taylor, M.R and Cayford, J. (2002). The U.S. Patent System and Developing Country Access to Biotechnology: Does the*

Balance Need Adjusting? Discussion paper 02-51, Resources for the future, Washington, D.C. 112p. Retrieved from http://www.rff.org/files/sharepoint/WorkImages/Download/RFF-DP-02-51.pdf

38. *Ukpabi, U.J. (2009). Potential of protected local institutional innovations in catalyzing Nigerian agro-industrial development. Journal of Agricultural Biotechnology and Sustainable Development, 1(3), 062 - 068. Retrieved from*
39. *http://www.taasti.org/assets/resources/Nigeria_3.pdf*
40. *United Nations Economic Commission for Europe (2011). Intellectual Property Commercialization: Policy Options and Practical Instruments. United Nations, New York, Geneva, 114p. Retrieved from*
41. *www.unece.org/fileadmin/DAM/ceci/publications/ip.pdf*
42. *Weihrich, H. (1982). Long Range Planning, 15(2), 54-66. Retrieved from www.sciencedirect.com/science/article/pii/0024630182901200*